Ultra-lightweight Core Materials

Completed Technology Project (2015 - 2017)

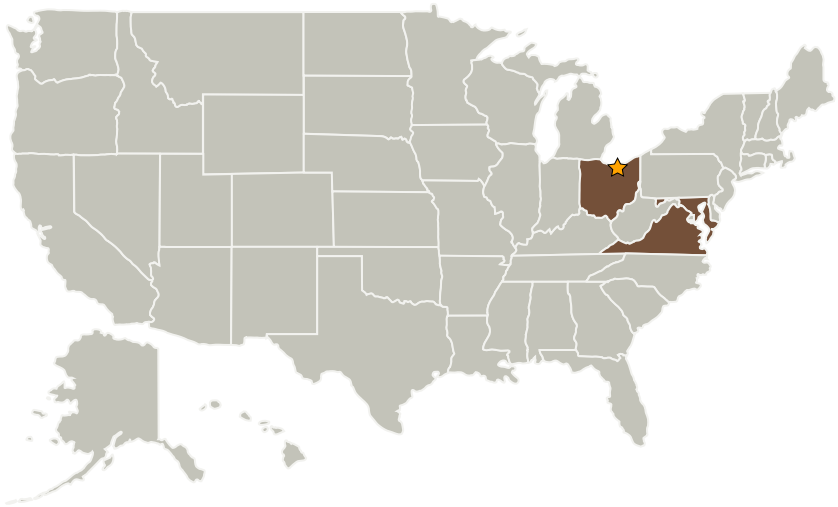
Project Introduction

Power and data cables for avionics and other parts of spacecraft add considerable weight to the vehicle

Anticipated Benefits

NASA Funded: In a potential NASA follow-on activity, a sandwich panel skirt segment (applicable to SLS upper stage) will be produced from ultra-lightweight core sandwich structures for subsequent testing. Commercial: The development of ultra-lightweight, multifunctional structures will enable significant reductions in the structural mass of future aerospace vehicles.

Primary U.S. Work Locations and Key Partners



Organizations Performing Work	Role	Type	Location
★Glenn Research Center(GRC)	Lead Organization	NASA Center	Cleveland, Ohio

Primary U.S. Work Locations	
Maryland	Ohio
Virginia	

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Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Center / Facility:

Glenn Research Center (GRC)

Responsible Program:

Game Changing Development

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Project Transitions

July 2015: Project Start

May 2017: Closed out

Closeout Summary: Two of the here vendors were able to produce 1 sq. ft. metallic nanolattice (HRL) and carbon nanotube composite honeycomb (Orbital) core panels (flat and curved) which were furnished to NASA for testing. These vendors also furnished sandwich panels from these cores (not required in the contact). While not all of the KPPs were met, significant advancement of the technology was made. Orbital and HRL were able to produce core materials with mechanical properties that exceed those of 3 lb/ft3 aluminum honeycomb (KPPs based upon 6 lb/ft3. TRL elevated to 4. The objective of this project was to develop and mature high payoff nanotechnologies for future NASA mission with a focus on technologies that could lead to significant reductions in vehicle weight and improvements in performance. The project successfully developed high strength carbon nanotube composites and, for the first time, demonstrated them in a load-bearing component (composite overwrap pressure vessel) that was flight tested on a sounding rocket as part of a cold-gas thruster system. The project also developed polyimide aerogel insulation for electrical wiring that is 90% lighter than conventional polymer insulation and carbon nanotube and metal nanolattice cores for composite sandwich structures with properties that exceeded those of conventional aluminum honeycomb cores at the same density.

Project Website:

https://www.nasa.gov/directorates/spacetech/home/index.html

Project Management

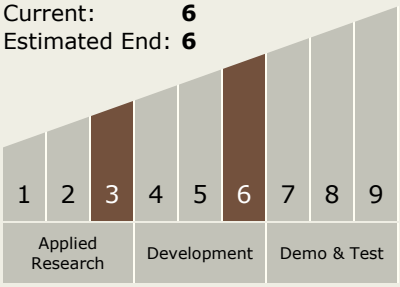
Program Director:
Mary J Werkheiser

Program Manager:
Gary F Meyering

Principal Investigator:
Azlin Biaggi-labiosa

Technology Maturity (TRL)

Start: **3**
Current: **6**
Estimated End: **6**



Target Destination

Foundational Knowledge